

RADAR STATION B-71
(Trinidad Radar Station)
(Klamath River Radar Station)
Redwood National Park
Coastal Drive
Klamath vicinity
Del Norte County
California

HAER CA-332
CA-332

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

FIELD RECORDS

HISTORIC AMERICAN ENGINEERING RECORD

National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

RADAR STATION B-71 (Trinidad Radar Station) (Klamath River Radar Station)

HAER No. CA-332

LOCATION: Redwood National and State Parks, Coastal Drive, Klamath vicinity, Del Norte County, California

DATE OF CONSTRUCTION: ca. 1942

BUILDER/ARCHITECT: Unknown, civilian construction company contracted by War Department

SIGNIFICANCE: Radar Station B-71 is a rare surviving example of a World War II radar station established to provide coastal defense for the United States. Although the equipment was removed long ago and only two buildings (the Power and the Operations buildings) remain, the radar station represents the U.S. development of radar technology in the first part of the twentieth century.

HISTORIAN: Justine Christianson, HAER Historian, 2005

PROJECT INFORMATION: The Radar Station B-71 Recording Project was a cooperative effort between the Historic American Engineering Record (HAER), part of Heritage Documentation Programs (Richard O'Connor, Acting Manager), Redwood National and State Parks (William Pierce, Superintendent), and the Pacific West Regional Office (Stephanie Toothman, Chief, Cultural Resources). Karin Anderson, Cultural Resources Program Manager for Redwood National and State Parks facilitated the project. James O'Barr, Museum Curator, provided access to the site and assistance with equipment. Justine Christianson and Kristen O'Connell, HAER Historians, did the fieldwork, and Justine Christianson wrote the historical report. Jet Lowe, HAER Photographer, produced the large format photography.

For individual building descriptions and histories, see Radar Station B-71, Power Building (HAER No. CA-332-A) and Radar Station B-71, Operations Building (HAER No. CA-332-B).

INTRODUCTION

Constructed around 1942, the remote Radar Station B-71 is located on a terrace about 3/4 of a mile from the mouth of the Klamath River near the towns of Requa and Klamath. The Coastal Drive, also called the Klamath Beach Road, accesses the site and runs parallel to the Pacific Ocean along a ridge. The flat terrace, sited about 100' west of and below the Coastal Drive, drops off to the Pacific Ocean. It provided a sizable strip of land on which radar operations could take place. A narrow, rather steep footpath that runs from a pull off on the side of the Coastal Drive to the terrace provides the only access to the buildings.¹ The location of the site as well as the vernacular construction of the buildings helped disguise its use from the local residents and enemy spies. Constructed of durable concrete blocks, the buildings were clad in board and batten siding and had architectural features reminiscent of local farm buildings. As First Lt. Dale Birdsall, Station Commander, remembered in 1988, the complex was "painted in earth tones, was not landscaped, and looked very much like the conventional coastal farm house in that area." In fact, he stated "the site was somewhat patterned after the Chapman ranch which had a farm house to the north of the site and from whom the War Department (or Defense Department) leased the land."² Camouflaging the buildings was essential to maintaining the secrecy of the site since the radar station complex was part of a coastal defense system designed to protect the nation's coast and adjacent territories and bases against enemy attack by land, air or sea.

DEVELOPMENT OF RADAR

Radar was arguably one of the most important advances of World War II because it revolutionized the method of gathering information on enemy activity. Radar, which is an acronym for **R**adio **D**irection **A**nd **R**anging, works by transmitting radio waves that bounce back from distant aerial objects.³ The distance from the transmission point to the object can be measured and an accurate location determined. Radar was so useful because its functionality remained "unimpaired even though the aircraft may be hidden by smoke, haze, clouds, darkness or is out of range of the human eye."⁴ Great Britain and the United States were at the forefront of radar development, working independently on the technology until 1940.

¹ Suzanne Baker and James Roscoe, Archaeology Consultants, Oakland, CA, Archaeological Site Record, April 4, 1983, World War II Observation Post vertical file, located in Redwood National and State Parks, South Headquarters, Library, Orick, CA, hereafter cited as REDW; Gordon Chappell, "Radar Station B-71," National Register of Historic Places Inventory Nomination Form, June 7, 1977, listed 1978, Item Number 7, Page 1.

² Letter, Dale Birdsall to Richard (Dick) Rasp, October 17, 1988, located in World War II Observation Post vertical file, REDW.

³ U.S. Navy Lt. Cmdr. Samuel M. Tucker and F.R. Furth coined the acronym "radar." The U.S. adopted the term in November 1940, while the British waited until July 1943. See Robert Buder, *The Invention that Changed the World: The Story of Radar from War to Peace* (New York: Simon & Schuster, 1996), 56.

⁴ War Department, *Signal Corps Field Manual, Aircraft Warning Service* (Washington, DC: U.S. Government Printing Office, August 3, 1942), 22, available online through <http://carlisle-www.army.mil/usamhi/>, Army Heritage Collection Online, accessed September 2005.

In the early twentieth century, Arthur Edwin Kennelly (in the United States) and Oliver Heaviside (in Great Britain) came independently to the same conclusion that radio waves “ricocheted between the Earth and some sort of conducting surface or high altitude boundary, later called the ionosphere, that kept them from vanishing into space,” thus establishing the theoretical basis for radar.⁵ Additional research in the 1920s allowed radar technology to develop: British researchers E.V. Appleton and M.A.F. Barnett proved the ionosphere existed and measured its height, while Americans Merle Tuve and Gregory Breit created a pulse transmitting system.⁶ In the United States, radar research began in earnest in the mid-1930s at the Naval Research Laboratory in Washington, DC. Robert Morris Page, working there under Albert Taylor and Leo Young, developed the “first system to incorporate the pulses synonymous with modern radar” in late 1934.⁷ Meanwhile, in Great Britain, the Scotsman Robert Watson-Watt became the leading proponent of radar technology. While working for the Meteorological Office at the Royal Aircraft Establishment during World War I, a superior asked Watson-Watt to determine how much power would be needed to “raise a man’s temperature enough to kill him.” While Watson-Watt determined the so-called “death ray” was not feasible, it did lead him to think of radio usage for other military endeavors, such as detection. On February 12, 1935, he drafted an influential memo entitled, “Detection of Aircraft by Radio Methods” in which he outlined all the available radar technology. As Robert Buderer points out in the *The Invention that Changed the World*, “what set Watson-Watt’s effort apart from its unknown competitors was largely the scope of the vision—a defensive network, accepted in principle at the highest governmental levels and backed by a leading member of the military.”⁸ The result of this was the development of both ground and airborne radar as well as a defensive chain of radar stations along the coast of England (known as Chain Home) in 1939.⁹

The research of the United States and Great Britain coalesced with the 1940 Tizard Mission, named after the leader of the group. Sir Henry Tizard, rector of Imperial College of Science and Technology and chairman of the Committee for the Scientific Survey of Air Defence, gathered together British radar experts to present to the United States “a full disclosure of the kingdom’s technical secrets in the hope that America, even if it stayed neutral, would gear up its immense industrial machine to help develop and produce them.”¹⁰ While the British and U.S. representatives may have initially been wary of sharing information, they soon discovered that each had separately been working on radar technology; “in fact, the British Chain Home Low, which guarded against low-flying planes, turned out to be virtually identical to the U.S. Navy’s

⁵ Buderer, 61. The atmospheric layer they discovered is now known as the Kennelly-Heaviside layer. For a brief biography of Arthur Edwin Kennelly, see http://www.ieee.org/organizations/history_center/legacies/kennelly.html, accessed September 2005.

⁶ Buderer, 61-62.

⁷ Buderer, 63.

⁸ Buderer, 54-56, 64.

⁹ See Buderer, 64 for information on Watson-Watt.

¹⁰ Other members of the Tizard Mission included Eddie Bowen, radar expert; John Cockcroft, a Cambridge University physicist and “architect of one of the world’s first proton accelerators”; one officer from the Royal Air Force, Admiralty and Army; and Arthur Edgar Woodward-Nutt from the Air Ministry who served as secretary. See Buderer, 31.

CXAM radar, operating on the same frequency and sharing several other technical features.”¹¹ The United States did not have the cavity magnetron (developed by British researchers J.T. Randall and H.A.H. Boot) that emitted high power, high frequency electromagnetic pulses. The cavity magnetron pushed American radar technology ahead since it produced much more power than tubes, upon which the U.S. relied. The cavity magnetron allowed radar systems to be installed in aircraft and also became a key component of microwaves. The other result of the Tizzard mission was the establishment of the Massachusetts Institute of Technology (MIT) Radiation Laboratory, also called the Rad Lab, which operated from 1940-1945. Following the British lead, U.S. scientists began experimenting with microwave technology since it had “greater immunity to jamming, greater range and directional accuracies, reduced ground clutter, and ability to discriminate between closely bunched targets” as opposed to the earlier longwave systems.¹² Other Rad Lab innovations included a predictor to track airplanes, a blind-landing system, precision bombing radar, Long-Range Navigation (LORAN) for ship navigation, and a Microwave Early Warning (MEW) set whose higher frequency could “resolve or distinguish between multiple targets far better than a long wave radar such as the SCR-270” although it was not put into use until 1944 and then primarily in Europe.¹³

Despite the rapport established between the scientific communities of Great Britain and the United States, the use of radar in defense of the two countries remained markedly different. Great Britain “used fixed station radars in a system well adapted to island defense,” but in the United States, the Signal Corps developed mobile radar sets that were more useful in creating a flexible defensive network that could span great distances and varied geographic locales.¹⁴ Despite U.S. advancements and differing needs, the British and even the U.S. Army Air Forces through the British models were better. The Signal Corps Radar Laboratory in Belmar, New Jersey, tested British models in the field against those they had developed and determined that radar equipment SCR-270 “gave better performance, whereas the British system for presenting and using radar gathered information was better.” Accordingly, the Signal Corps began developing ways of incorporating the British innovation of Plan Position Indicator (PPI) into installations.¹⁵

While the durable construction of both SCR-270 and 271 and the long range of SCR-271 (up to 150 miles) recommended them to the U.S. military, British radar expert Robert Watson-Watt found them lacking. He criticized the Signal Corps-developed radar (particularly SCR-270) as ineffective and found the radar training to be poor. He also condemned the Signal Corps leadership for having unrealistic expectations about the function of radar. Watson-Watt

¹¹ Buder, 36.

¹² Buder, 83.

¹³ Buder, 132-135; Arthur Vieweger and Albert S. White, “Development of Radar SCR-270,” 22; available online at <http://www.monmouth.army.mil/historian>, accessed September 2005.

¹⁴ Vieweger and White, 21.

¹⁵ Vieweger and White, 21-22. PPI was the “forerunner of modern radar’s easy-to-read cathode ray tube. In the PPI, a pencil-thin sweep rotates rapidly around the screen, painting in all aircraft within its coverage zone in their exact relationship to the station, dramatically simplifying picture interpretation and obviating the need to convert separate range and azimuth data to a distinct coordinate, steps that avoided confusion and saved precious time directing fighter interceptors toward the enemy,” Buder, 78.

recommended the 270s be replaced on the West Coast by “British CHI/CGI sets equipped with continuously rotated antenna arrays and with plan position indicators.” The countering assessment is that real weakness of American radar was not in the sets themselves but in the lack of trained personnel to man the equipment.¹⁶ The British were not the only skeptics; the U.S. Army Air Forces agreed that British models were superior. In fact, the Air Forces “had already insisted that the Signal Corps copy the original British CGI.”¹⁷ A listing of stations along the Pacific Coast reveals that such demands were far from being filled; rather, there existed a mixture of sets (see Appendix A).

After the attack on Pearl Harbor, the U.S. took the role of radar in the defense of the nation much more seriously. The U.S. Navy, Signal Corps, and Army Air Corps each sent a liaison officer to the Rad Lab to investigate radar technologies. The Signal Corps was at the forefront of all branches in radar development, with Fort Monmouth, New Jersey, the “Home of the Signal Corps,” the center. It had been established as a camp in 1917 with laboratories for developing communications tools, the Signal Corps School for training Army personnel, and a carrier pigeon program. The Signal Corps Laboratories, established in 1929, were a combination of the laboratories in Washington, DC, including the Signal Corps Electrical Laboratory, the Signal Corps Meteorological Laboratory, and the Signal Corps Laboratory at the Bureau of Standards, as well as the Radio Laboratory already in existence at Fort Monmouth. The laboratories developed most of the equipment used during World War II. In 1940-1941, the Signal Corps established three field labs, numbers 1-3, with radar developed at Field Lab 3.¹⁸ By 1937, Fort Monmouth researchers had developed SCR-268, “the original ancestor of all Army and U.S. Air Force radars,” enough that it could impress the Secretary of War in a test demonstration.¹⁹ They began work on SCR-270 and 271, responding to “the growing requirement for a long range radar to provide early warning information to interceptor squadrons,” and by mid summer 1938 had early models of both in place at Twin Lights, New Jersey.²⁰ Both SCR-268 and SCR-270 were long-range mobile radar sets mounted on trailers rather than being installed in a permanent structure like the later SCR-271. In May 1940, the Army adopted SCR-270, and in August that same year awarded the construction contract to Westinghouse, rather than having the Signal Corps laboratories working with contractors produce them.²¹ That same year, production began on the fixed SCR-271.

¹⁶ George Raynor Thompson, Dixie R. Harris, Pauline M. Oakes, and Dulaney Terrett, *The Signal Corps: The Test (December 1941 to July 1943)* (Washington, DC: Center of Military History, U.S. Army, 1957), 93-95.

¹⁷ Thompson, et al., 96.

¹⁸ The Signal Corps School was established in 1919. It had several names: from 1921 to 1935 it was known as the Signal School; from 1935 to 1942 it was called the Signal Corps School; and finally it became the Eastern Signal Corps School. See “Concise History of Fort Monmouth, New Jersey and the U.S. Army Communications-Electronics Life Cycle Management Command,” June 2005, available at <http://www.monmouth.army.mil/historian/>, accessed September 2005.

¹⁹ Vieweger and White, “Development of Radar SCR-270,” 19. They note that both SCR-268 and SCR-270 had many modifications and adaptations and should be thought of as a “family of sets”. The acronym SCR itself is somewhat confusing as three definitions have been found: Searchlight Control Radar, Signal Corp Radio, and Set Complete Radio.

²⁰ Vieweger and White, 20, there is also a photograph of the Twin Lights, NJ installation.

²¹ Vieweger and White, 20.

There were numerous other radars, both ground and air, developed in this period. Ground radars used for air defense included: Harbor Surveillance Radar (SCR-582, later 682) for detecting vessels; Microwave Radar for Ground-Controlled Interception (SCR-615); Lightweight Warning Radar (SCR-602), which was a lightweight and portable radar that “came to be one of the most important and numerous of aircraft detectors”; and Microwave Tracking or Gun-Laying Radar (SCR-584), which could “automatically track an unseen target at night or in cloud or fog, supplying range, azimuth and elevation data to a gun director, which aimed the guns of a battery.”²² Airborne radars developed by the Signal Corps in 1942 included: Identification Radar like SCR-535; altimeters, which were installed in aircraft and “could give an exact clearance above the ground on water below” like SCR-718; Airborne Interception Radar like SCR-520 that could also be installed in aircraft; and Air-to-Surface Vessel Microwave Radar like SCR-517, which was allegedly the “most important radar developed during 1942.”²³

After the development of an effective radar system, the next step was to create a defense system like the British had in place with the Chain Home network. On February 26, 1940, the War Department created the Air Defense Command led by Brig. Gen. James E. Chaney at Mitchel Field, New Jersey. The Air Defense Command was “primarily a planning agency, charged with development of a system of unified air defense for cities, vital industrial areas, continental bases, and armies in the field.” Consisting of ten officers, the command studied the “problem of protecting important areas and installations by interception and destruction of attacking enemy forces.” The Air Defense Command identified three essentials for creating an effective aircraft warning service: radar stations, a ground observer system, and filter and information centers.²⁴ The reality of few radar sets capable of working on land and water and even fewer qualified operators hampered the Air Defense Command’s plans somewhat, but by the end of 1941, an umbrella organization called the Aircraft Warning Service was in place.

AIRCRAFT WARNING SERVICE

The Aircraft Warning Service oversaw the network of radar stations, including B-71. According to the 1942 *Signal Corp Field Manual, Aircraft Warning Service*, its mission was to “observe the movement of aircraft and to collect and exhibit the information obtained” in order to protect the nation’s coasts and adjacent territories and bases against enemy attack by land or by sea. Its functions included: organizing and training military observation posts and non military observers; installing, operating and maintaining observation posts; providing “suitable signal communications equipment for the transmission of information and orders”; providing information centers; and coordinating the activities of the Aircraft Warning Service with other military agencies.²⁵ In addition to its general defensive mission, the defense command had to coordinate with the adjacent country’s military, such as in the West where the defense command had liaisons with the Canadian military and naval authorities as well as Mexican commanders of

²² Thompson, et al., 256-265.

²³ Thompson, et al., 242-249.

²⁴ Wesley Frank Craven and James Lea Cate, eds., “Plane and Early Operations January 1939 to August 1942,” Volume 1, *The Army Air Forces in World War II* (Washington, DC: Office of Air Force History, 1983), 153.

²⁵ War Department, *Signal Corps Field Manual*, 5.

military areas and garrisons. In December 1941, the Western Defense Command was established with headquarters in San Francisco. It oversaw nine western states as well as Alaska and the Aleutians. There were also three associated Air Forces: Fourth Air Force, Second Air Force, and the Alaskan Air Force. The Eastern Defense Command, headquartered in New York City, oversaw the eastern seaboard states, Newfoundland, and Bermuda. The First and Third Air Forces oversaw this command.²⁶

By 1941, there were thirteen radar stations on the East Coast from Key West to Maine with another eight nearing completion, supplemented by 4,000 ground observer stations. On the West Coast, there were ten radar stations covering 1,200 miles from San Diego to Seattle and 2,400 ground observer stations.²⁷ From 1941-42, the chain of stations grew to include Mexico and Canada on the West Coast as well as Newfoundland and Iceland on the East Coast. There was also a string of defense posts in Alaska running from Fort Glenn on Otter Point on Umnak Island to the Pribilof Islands to Nome. The Signal Corps Alaska Communication System (ACS), “engineered, constructed, maintained and operated a vast radio, ocean cable and landline communication system” between American bases and the Alaskan mainland.²⁸ A chain of ground radar, including SCR-270 and 271, stood along the coasts of the United States on “guard to alert the guns, searchlights and interceptors of the defense stations against the approach of enemy aircraft.”²⁹ By the end of 1941, “America had an existing early warning Radar System around its perimeter” with the “SCR-270-271 series of Radars...at the heart of the system,” of which Radar Station B-71 was a part.³⁰

To most effectively use radar, the United States and Great Britain each developed techniques to optimally site the equipment. The U.S. Army consequently developed basic siting and operation guides for radar equipment, noting that “sites occupied or being prepared for occupation of 270 and 271 equipment should be reviewed carefully.”³¹ Guidelines for Chain Home Low-flying Early Warning Radar (CHL) sites, which provided early warning of aircraft and were usually

²⁶ Craven and Cate, 292. Information about the defense commands also available in military records at the National Archives and Records Administration: “WDC Plans and Agreements,” lecture delivered by G-3, Washington, DC, May 1, 1944, Western Defense Command Signal Section folder, RG 499, Records of the U.S. Army Defense Commands WWII, Box 27, location 290/38/17/4, National Archives and Records Administration, College Park, Maryland (hereafter cited as NARA); Ltr. TAG, AG 381 (23 Mar 44) OB-S-E, Subject: Defense of the Continental United States—Defense Commands, dated 5 Apr 44, RG 499, Records of the US Army Defense Commands (World War II), Box 11, 32.3 Defense Commands WDC, EDC, SDC, Mission of WDC, location 290/38/20/1-3, NARA; For Immediate Action, 5 April 1944, from the Adjutant General Office from Washington, Subject: Defense of the Continental United States—Defense Commands to Commanding Generals: EDC, SDC, WDC, RG 499, Records of the U.S. Army Defense Commands (World War II), Box 11, 32.3 Defense Commands WDC, EDC, SDC, Mission of WDC, location 290/38/20/1-3, NARA.

²⁷ Craven and Cate, 290-291.

²⁸ Thompson, et al., 123.

²⁹ Thompson, et al., 83.

³⁰ Vieweger and White, 22.

³¹ “Basic Siting and Operational Guides for Radar Equipment for AWS and Interceptor Control” Folder, 2, in Box 27, Records of Fourth U.S. Army & Western Defense Command S10 Signal Section, RG499, Records of U.S. Army Defense Commands WWII, location 290/38/17/4, NARA.

sited on the coast, were developed.³² In the United States, the generally coastally situated CHL stations were located at: Cape Flattery, Pacific Beach, Tillamook Head, Point Arena, Bolinas, Point Montara, Point Conception, Santa Rosa Island, Santa Catalina Island, San Nicholas Island, San Clemente Island, and Otay Mt (see Appendix A).³³ The main function of the CHL station was detecting enemy aircraft from as far away as possible. In order for the station to be effective, land configuration and height above sea level had to be considered. The optimal site was about 200' above sea level and situated on a slope, which would help "ensure that the unwanted back radiation is reflected upward." Sites to avoid were those on top of hills "except when there are no other large land objects in range" and the bottom of cliffs since that could "produce an increase in the fixed echo configuration."³⁴ Other factors to consider were access since generators, equipment, and phone lines would have to be transported to the site. There were also recommendations for camouflaging: "If possible, the station should be arranged so that at dawn and in the early morning, the shadow [from the array] falls on some dark area such as a wood or an irregular collection of bushes. It is often advantageous to simulate bushes for this purpose by laying down piles of steel wool or other material." If the station faced west or north-west, camouflaging it with shadows would not work. In those cases, "the antenna should be arranged so that they are at least partially in the shadow of trees or other objects to the east of them."³⁵ There were also guidelines for Ground Control Intercept (GCI) stations, whose purpose was to accurately locate enemy aircraft's position and height. GCI stations (located on the West Coast at Paine Field, Washington and Tacoma, Washington for example) would ideally be inconspicuously located on level ground. They had to utilize as little metal in their construction as possible, and there could not be any overhead wires. Buildings were to be located 70 yards from the aerials and no wire coil defenses could be used less than 50 yards from the aerials. Access was also an important factor since equipment, a generator, and telephone lines had to be brought to the site.³⁶

The best sites for radar installation were ultimately "part way down a hill and on a slope where beams from the radar would be reflected up and away from the station."³⁷ Radar Station B-71's siting reflects these recommendations and those for CHL and GCI stations. Its location on a terrace with a slope behind allowed radar to be reflected, while maintaining the natural environment around the site provided camouflaging. In fact, the radar station looked so much like other local farmsteads that it even had sheep wandering around the site.³⁸ The issue of

³² "The Siting of CHL Stations in North America," "Basic Siting and Operational Guides for Radar Equipment for AWS and Interceptor Control" Folder, 1, NARA.

³³ Memo No. 132-4, "New Code Designation of Radar Stations," by command of Brigadier General Kepner from Headquarters IV Fighting Command, Office of the Commanding General, Oakland, CA, November 6, 1942, REDW.

³⁴ "The Siting of CHL Stations in North America," 3-4, emphasis in original.

³⁵ "The Siting of CHL Stations in North America," 5-6.

³⁶ "The Siting of GCI Stations in North American," "Basic Siting and Operational Guides for Radar Equipment for AWS and Interceptor Control" Folder, 6, NARA.

³⁷ Thompson, et al., 144.

³⁸ Dale Birdsall, First Lieutenant at the station, recalled, "in very foggy wet weather the sheep would occasionally walk under our low level transmission line and cause temporary interruptions." He hastened to add the equipment

access was also solved at this site since the Coastal Drive and a smaller path down the terrace itself would have provided a way for supplies to reach the station.

RADAR STATION B-71

Radar Station B-71, also known as Trinidad, Eureka, and Klamath radar stations, was the northernmost station in California and was a part of an overall air defense plan to construct seventy-two aircraft warning stations on the Pacific Coast from Washington to Mexico.³⁹ The station reported to a filter station in Berkeley, California.⁴⁰ This string of radar stations was necessary to provide information about plane activity. Established around 1943, the site participated in radar defense until July 1, 1944, when the Fourth Air Force converted the station to emergency rescue operations.⁴¹ At first, the detachment to the radar station was attached to Company 653rd Signal Aircraft Warning to 4th Air Force and later to Squadron 411th AAF Base Unit to 4th Air Force.⁴² Originally, the radar station had “an SCR-270B portable long-range (120 to 150 mile) radar system” that probably came from Radar Station B-38 on Santa Rosa Island. A “permanent” SCR-271 system replaced that sometime between December 1943 and April 1944.⁴³

The best descriptive information about the station comes from the recollections of Dale Birdsall, who was Station Commander, First Lieutenant for a time during World War II.⁴⁴ Birdsall recalled his service at the radar station in communications with Gordon Chappell, Regional Historian of the National Park Service and author of the 1977 National Register nomination of the site. Birdsall attended Knox College in Galesburg, Illinois and participated in Reserve Officers' Training Corps (ROTC), graduating with a Second Lieutenant Commission and a Bachelor of Science Degree in Physics. He then transferred to the Signal Corps and went to Fort

never harmed any of the sheep. Letter from Dale H. Birdsall to Gordon Chappell, Regional Historian, NPS, September 27, 1982, World War II Radar Station vertical file, REDW.

³⁹ Letter from James N. Eastman, Jr. Chief, Research Branch, Albert F. Simpson Historical Research Center, USAF HOF Maxwell AFB, AL 36112, to Gordon Chappell, located in “History and Archaeology Historic Sites and Structures Management and Preservation, 1976-1977,” H30 vertical file, REDW.

⁴⁰ Questionnaire submitted to O.S. Whitehead, prepared by Gordon Chappell, December 27, 1976.

⁴¹ Eastman to Chappell. The Fourth Air Force, initially established in October 1940 and activated in December 1940 as the Southwest Air District, provided air defense and training for new units. During World War II, its headquarters were at Riverside, California in January 1941; Hamilton Field, California in December 1941; and San Francisco, California in January 1942. Information about Fourth Air Force available at http://www.maxwell.af.mil/au/afhra/wwwroot/rso/numbered_airforce_index.html#4af, accessed September 2005.

⁴² Unit records for troops stationed in the United States are notoriously difficult to find, and these were no exception. Research at the National Archives and Records Administration, College Park, Maryland by this author did not yield any information.

⁴³ Chappell, National Register nomination, Item Number 8, Page 2; Letter from Birdsall to Chappell. Birdsall stated that around 1944, the Corps of Engineers installed SCR-271 buildings and equipment so there is some discrepancy about the date of the switch from mobile to fixed radar.

⁴⁴ Unfortunately, no photographs dating to the World War II era have been discovered, which Birdsall attributes to the fact that “cameras were taboo due to the classified nature of the sites,” in a letter from Birdsall to Chappell. The Department of Army, U.S. Army Audio Visual Activity, Washington, DC, reported having no photographs in June 1977. Searches of appropriate record groups at the National Archives and Records Administration by this author yielded no specific information about or photographs of Radar Station B-71 either.

Monmouth, New Jersey, where he graduated in 1941 in the first Radar School class. Birdsall recounted, "I took command of the unit which was transferred from Santa Rosa Island very shortly after they arrived at Klamath. The exact dates I do not make available but I assumed command early in June 1943." He commanded the radar station until September 1943 when he left for the 653rd Signal, AW Company, Hamilton Field, California.

At the time of Birdsall's command, the radar crew consisted of forty-one enlisted men from the Army Air Corps and two officers, with a National Guard unit attached to the station for security. Personnel "originally lived in the old Klamath Grange hall in the center of the town of Klamath," located to the east of the station. By 1944, personnel lived in newly constructed barracks located to the south of town. During their off duty hours, Birdsall remembered that the men frequented Klamath's bars, gambled, fished, and attended movies at the local movie theater. Although the local residents knew the purpose of the station, "a real effort was made to keep station activities and mission as secret as possible. However, it was common knowledge that B-71 was a radar station but its mission capabilities, and overall function were not well understood."⁴⁵

Several structures and features that were once vital parts of Radar Station B-71's operation have since disappeared. According to Birdsall, there was a guard post at the entrance of the station staffed by a National Guard member, whose task "was mainly to verify a person's authority to enter." The guard post was located near what is now the Coastal Drive and the trail that leads down to the terrace on which the station is located. A National Guard unit, consisting of eight to twenty personnel and one officer, not only manned the post, but also filled the roving guard position.⁴⁶ The site had a privy, which is no longer standing but was extant when the National Park Service acquired the property. A Classified Structure Field Inventory Report from 1975 described the privy as a rectangular wood frame building with horizontal wood siding and a shed roof that had wire-screened vents. Only three walls remained at that time. The two-hole privy stood "about 95 feet northeast of the northeast corner of the operations building" according to the National Register nomination.⁴⁷ For protection, there were also machine gun emplacements whose locations have since been overgrown with vegetation. They were described as measuring 12' in diameter and holding "50 caliber machine guns on anti-aircraft mounts." The National Register nomination states that there were three of these on the site, and locates them "about 225 feet south-southwest of the southwest end of the power building" and "about 100 feet northwest of the operations building," with the location of the third undetermined.⁴⁸ This contradicts Dale Birdsall's statement that there were two 50-caliber water-cooled anti-aircraft machine guns and 45 caliber Thompson sub-machine guns. The enlisted men also provided security since they were armed with one M-1 or Enfield 30-06, while each officer had one 45-caliber automatic

⁴⁵ Letter from Birdsall to Chappell.

⁴⁶ Letter from Birdsall to Chappell.

⁴⁷ K. Keane, Classified Structure Field Inventory Report, Latrine, World War II Observation Post, November 19, 1975, in World War II Observation Post vertical file, REDW; Gordon Chappell, "Radar Station B-71," Item Number 7, Page 2.

⁴⁸ Letter from Birdsall to Chappell; Chappell, "Radar Station B-71," Number 7, Page 2.

pistol. The station also had vehicles, including one 1/4 ton 4x4 Jeep, one 1/2 ton (later 3/4 ton) weapons carrier 4x4; and one 2 1/2 ton GMC 6x6.⁴⁹

Finally, the various mobile antennas that stood west of the Operations Building near the edge of the terrace are another feature that have long since disappeared. In 1943, there was a mobile SCR-270B radar antenna “consisting of a rectangular metal grid mounted vertically on a pole of triangular [sic] metal framework, the whole assembly carried on a wheeled trailer to make it mobile.” The antenna was “installed uncamouflaged about 30 feet west of the operations building.” This was followed “by two different ‘permanent’ radar systems in succession, their antenna locations and other features not at present known.”⁵⁰ In sketches, Birdsall depicted a 50’ tall tower with eight identical antenna bays that measured about 8’ long. The tower itself was a triangular shape with the antenna bays spaced evenly along its length. The antenna bays consisted of an open wood frame measuring 4’ deep. Attached to the front of the frame by porcelain insulators measuring about 3/4” diameter x 4” long were four 3/8” diameter silver-plated copper tubing. These “active antenna elements” electrically connected the antenna to the receiver and transmitter. In the middle of the frame and also connected by the porcelain insulators were reflector elements that “concentrated energy in a forward direction.” The wood frame itself was attached to the tower. The antenna sat on a stand attached to a trailer and was fully transportable. Birdsall noted, “for transporting, the antenna was lowered with winch in rear, bays were removed and the antenna tower, which was hinged in the center, was folded down on the trailer.”⁵¹

The most substantial buildings on the site are the extant Power Building and Operations Building. Constructed by a civilian construction company of concrete blocks and camouflaged with wood siding and other architectural features to make them appear like local farm buildings, these two structures contained the radar equipment.⁵² The Operations Building (for more information, see HAER NO. CA-332-B) was disguised as a barn with a pulley and a fake hayloft on the north end. It housed the radar equipment, including a transmitter, rectifier, receiver, keyer, oscilloscope, and plotting board.⁵³ According to the War Department, the equipment had to be run by “highly trained specialists.”⁵⁴ The minimum crew manning the radar station consisted of a crew chief and relief man, two operators and a maintenance technician.⁵⁵ A transmission line ran from the antenna, located about 30’ away, to the Operations Building where it connected to the transmitter. The antenna probably switched between transmitting and receiving signals. A signal would be transmitted to the target, then an echo would be received

⁴⁹ Letter from Birdsall to Chappell.

⁵⁰ Chappell, National Register nomination, Number 7, Page 2.

⁵¹ Dale Birdsall, Antenna sketches, October 15, 1985, World War II Radar Station vertical file, REDW; World War II Radar Station Site Plan annotated by Dale Birdsall, World War II Radar Station vertical file, REDW.

⁵² For detailed descriptions of the buildings, see Radar Station B-71, Power Building, HAER No. CA-332-A, and Radar Station B-71, Operations Building, HAER No. CA-332-B. O.S. Whitehead in a questionnaire stated that a civilian company built the complex.

⁵³ Operations Building floorplan annotated by Dale Birdsall showing equipment inside, World War II Radar Station file, REDW.

⁵⁴ War Department, *Signal Corps Field Manual*, 22.

⁵⁵ Operations Building floorplan annotated by Dale Birdsall, World War II Radar Station vertical file, REDW.

and the delay between the two measured. The oscilloscope, manned by an observer, was located adjacent to the receiver, and it displayed the echo on a cathode ray tube, creating a visual record of the pulse. The Operations Building also contained a rectifier, which was a semiconductor crystal that translated signals into a current, and a keyer. Finally, there was a plotting board where the plotter converted “polar coordinates to grid coordinates for transmission,” mapped “observers reports and was in direct communication with San Francisco, the location of the regional information center.”⁵⁶ The Power Building (for more information, see HAER NO. CA-332-A) housed electrical generators driven by LeRoi gasoline engines at first and then two Caterpillar Diesel M6 sets.⁵⁷ The Power Building sits about 50 meters south of the Operations Building and was disguised as a farmhouse complete with dormer windows.

Radar Station B-71 does not seem to have seen much action during the war. During his time at the station, Birdsall remembered only one incident, which occurred in mid-July 1943. About 2 a.m., the station received a call from the San Francisco Information Center from a Radar Officer saying “they had just been notified by the Coast Guard that their patrol in Crescent City had reported that the ‘enemy’ was landing in large numbers on Crescent Beach and we should take any steps necessary to protect our situation.” Just the day before, the station had received 50 caliber machine guns, shipped in boxes and covered with Cosmoline “a very heavy protective grease that could only be removed in boiling water.” The station was in an uproar as personnel tried to arm themselves and work out a “reasonable ‘defense’ plan” because they only had plans for cases of sabotage. Two hours later, the San Francisco Information Center called again stating “the Coast Guard patrol had sent the wrong coded message.” Instead of an imminent enemy landing, the Coast Guard had meant to report “lights had been sighted at sea.”⁵⁸

After the war, the station reverted back to E.H. & A. Chapman’s ownership, from whom the War Department leased the land.⁵⁹ The buildings remained as constructed, although Gordon Chappell in the National Register Nomination speculates that there may have been some salvaging of the siding by locals. With the establishment of Redwood National Park in 1968, the site became part of the park and under the purview of the National Park Service. The history of the site between World War II and the park’s establishment is currently unknown, but the Power Building and Operations Building managed to survive relatively intact.

CONCLUSION

Radar Station B-71 is a rare surviving example of a World War II radar station established to provide coastal defense for the United States. Although the equipment was removed long ago

⁵⁶ Letter from Birdsall to Chappell; Operations Building floorplan annotated by Dale Birdsall, World War II Radar Station vertical file, REDW; War Department, *Signal Corps Field Manual*, 22.

⁵⁷ From questionnaire on history of Radar Station B-71 during World War II from Gordon Chappell to Dale Birdsall, September 27, 1982, World War II Radar Station vertical file, REDW.

⁵⁸ Letter from Birdsall to Chappell.

⁵⁹ Thanks to Edie Butler, Special Collections, Humboldt State University, for finding the lot on Metsker’s Atlas of Del Norte County, California (Tacoma, WA: Metsker Maps, ca. 1949).

and only two buildings remain, the radar station represents the U.S. development of radar technology in the first part of the twentieth century.

APPENDIX A: List of Existing and Proposed Pacific Coast Radar Stations

From memorandum dated November 6, 1942 from the Headquarters IV Fighter Command, Office of the Commanding General, Oakland California and from data sheet dated August 22, 1944, available at REDW.

Other planned radar stations for which there was not enough information provided to include in the list include: B-69, O-24, B-26, F-83, F-87, X-37, and O-42.

Seattle Air Defense Wing (ADW), all located in Washington state

New Code Name	Old Code Name	Classified Name	Station Type and Set	Other Names of Station	Status, as of August 1944
F-50	None	Paine Field	GCI-588	Everett, Edgecomb, Marysville	planned, completed, operated, remains
X-52	None	Joyce	516	Juan de Fuca Strait	planned, construction not completed, operated, removed
X-53	None	Clallam Bay	516	Juan de Fuca Strait	planned, construction completed, operated, removed
X-54	W, X-21	Neah Bay	516	Juan de Fuca Strait	planned, construction not completed, operated, removed
B-55	B-21	Portage Head	270-B	Portage Head, Neah Bay	planned, completed, operated, removed
J-55	None	Cape Flattery	CHL-588	Portage Head, Bahobohosh	planned, completed, operated, remains
O-55	None	Cape Flattery	CH		planned, never built
B-57	B-22	Ruby Beach	270-B		planned, completed, operated, remains
O-58	None	Queets	CH		planned, never built
F-59	None	Tacoma	GCI-588	Fort Lewis, Orillia	planned, completed, operated, remains
J-61	None	Pacific Beach	CHL-588	Cape Elizabeth	planned, completed , operated, remains
B-61	B-23	Pacific Beach	270-B	Point Grenville	planned, completed, operated, remains
B-62	B-23-A	Grayland	270-B		planned, completed, operated, remains
L-63	None	Grayland	CHB-588	South Bend	planned, completed, operated, remains
O-64	None	Grayland	CH		planned, never built

Portland ADW, located in Oregon, Washington

New Code Name	Old Code Name	Classified Name	Station Type and Set	Other Names of Station	Status, as of August 1944
J-23	None	Tillamook Head	CHL-588		planned, completed, operated, remains
B-25	Same	Tillamook	270-B	Oceanside, Tillamook, Cape Foulweather	planned, completed, operated, remains
B-26	Same	Siletz Bay	270-B	Cape Foulweather, Siletz Bay, Delake	planned, completed, operated, remains
B-27	Same	Yachats	270-B	Cape Perpet	planned, completed, operated, remains
B-28	Same	Cape Arago	270-B		planned, completed, operated, removed
B-29	Same	Cape Sebastian	270-B	Postil River	planned, completed, operated, remains

San Francisco ADW, all located in California

New Code Name	Old Code Name	Classified Name	Station Type and Set	Other Names of Station	Status as of August 1944
B-71	None	Trinidad	270-B	Trinidad, Klamath River	planned, completed, operated, remains
B-72	B-1	False Cape	270-B	Bear Ridge, Cape Mendocino	planned, temporary camp facilities, operated, removed
B-74	B-2	Fort Bragg	270-B		planned, plans to relocate, operated, remains
J-75	None	Point Arena	CHL-588		planned, completed, operated, remains
B-76	B-3-A	Jenner	270-B		planned, completed, operated, remains
J-77	None	Bolinas	CHL-586	Double Point	planned, completed, operated, remains
B-78	B-3	Mt. Tamalpais	270-B		planned, completed, operated, remains
O-77	None	None	CH	Bolinas, North of Bay	planned, never built
J-80	None	Point Montara	CHL		planned, completed, operated, remains
O-81	None	None	CH	South of Bay	planned, completed, operated, removed
L-82	None	Half Moon Bay	CHB	Point Montare	planned, completed, operated, remains
B-84	B-5	Pigeon Point	270-B	Chalks Ridge, Pescade	planned, completed, operated, remains
B-85	B-6	Point Sur	270-B	Carmel, Pt. Lobos	planned, completed, operated, remains
B-86	B-6-A	Cambria	270-B	San Simeon	planned, completed, operated, remains

Los Angeles ADW, all located in California

New Code Name	Old Code Name	Classified Name	Station Type and Set	Other Names of Station	Status as of August 1944
B-30	B-7	Point Arguello	270-B	Surf Lompoc	planned, completed, operated, remains
J-31	None	Pt. Conception	CHL-588		planned, completed, operated, remains
X-32	X-2	Gaviota	516	Refugio Beach	planned, completed, operated, removed
X-33	X-1	Goleta	516	Santa Barbara Point	planned, completed
L-35	None	Oxnard	CHB-588	Point Huenem	planned, completed, operated, remains
B-36	B-8	Dume Point	270-B	Triunfo	planned, completed, operated, remains
B-38	None	Santa Rosa Isl.	270-B		planned, completed, operated, removed
J-38	None	Santa Rosa Isl.	CH-588		planned, completed, operated, remains
L-39	None	Santa Ana	CH-588	Newport Beach	planned, completed, operated, remains
X-40	None	San Clemente Beach	516	Capistrano Beach	planned, temporary, operated, removed
B-41	B-10	Santa Catalina Island	270-B	Grape	planned, completed, operated, remains
J-41	None	Santa Catalina Island	CHL-588	Buffalo	planned, completed, operated, remains
J-42	B-9	San Nicholas Island	CHL-588		planned, completed, operated, remains

San Diego ADW, located in California, Arizona

New Code Name	Old Code Name	Classified Name	Station Type and Set	Other Names of Station	Status as of August 1944
L-1	None	Oceanside	CHB-588		planned, completed, operated, remains
X-2	None	Encinitas	516	Cardiff	planned, temporary, operated, removed
B-3	B-11-A	San Clemente Island	270-B	Fleet Training Base	planned, completed, operated, remains
B-4	B-11	San Clemente Island	270-B	China Point	planned, completed, operated, removed
J-4	None	San Clemente Island	CHL-588	China Point	planned, completed, operated, remains
B-5	B-12	La Jolla	270-B		planned, completed, operated, remains
O-5	None	San Diego	CH	La Jolla	planned, never built
L-6	None	Mission Beach	CHB-588	Ryan Airport	planned, completed, operated, remains
B-8	B-13	Otay Mt.	270-B	Dulzura	planned, completed, operated, remains
J-8	None	Otay Mt.	CHL-588		planned, completed, operated, remains
F-9	None	El Centro	GCI-588		planned, completed, operated, remains
X-10	None	Calexico	516	Imperial Valley	planned, temporary, operated, removed
X-11	None	Ogilby	516	Imperial Valley	planned, temporary, operated, removed
X-12	None	Gadsden, AZ	516	Imperial Valley	planned, operated, removed
B-13	B-17	Yuma, AZ	270-B		planned, temporary, operated, removed

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Mexico ADW

New Code Name	Old Code Name	Classified Name	Station Type and Set	Other Names of Station	Status as of August 1944
B-92	B-14	Punta Salsipuedes	270-B		planned, operated, removed
B-94	B-15	Punta San Jacinto	270-B		planned, operated, removed
B-97	B-16	Punta Estrella	270-B	Punta Diggs, San Felipe	planned, operated, removed

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